

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

IN RE: **GOSFORD ROAD WATER COMPANY**
Water System No. 1502622

TO: Ms. Penny Stevents, Secretary-Treasurer
Gosford Road Water Company
5712 Wisteria Valley Road
Bakersfield, CA 93306

CC: Seaco Technologies
Kern County Environmental Health Services Department

CITATION FOR NONCOMPLIANCE
TOTAL COLIFORM MAXIMUM CONTAMINANT LEVEL VIOLATION
JULY 2013

Issued on July 16, 2013

Section 116650, Chapter 4, Part 12, Division 104 of the California Health and Safety Code (CHSC), authorizes the issuance of a citation for failure to comply with a requirement of the California Safe Drinking Water Act, or any regulation, standard, permit, or order issued hereunder.

VIOLATION

The Drinking Water Field Operations Branch of the Department of Public Health (hereinafter 'Department') hereby issues a Citation to Gosford Road Water Company (hereinafter 'Water Company'), for failure to comply with Section 116555(a)(1) of the

1 CHSC and Section 64426.1(b)(2) of Title 22, California Code of Regulations (CCR).
2 Specifically, the Water Company (mailing address: 5712 Wisteria Valley Road,
3 Bakersfield, CA 93306) failed to comply with the total coliform Maximum Contaminant
4 Level (MCL) for the month of July 2013.

5
6 Section 64426.1(b)(2) specifies that a public water system collecting fewer than 40 samples
7 per month is in violation of the total coliform MCL when more than one sample collected
8 during any month is total coliform-positive.

9
10 The Water Company is required to collect a minimum of one (1) distribution system
11 bacteriological sample per month. The bacteriological water analysis results submitted by
12 the Water Company reported the presence of total coliform bacteria in three (3) of nine (9)
13 samples collected by the Water Company in 2013. None of the positive samples showed
14 the presence of fecal coliform or *E. coli* bacteria.

15
16 Upon being informed of the presence of total coliform bacteria in three (3) routine samples
17 collected on July 2, 2013, Water Company staff collected a total of four (4) repeat samples
18 on July 8, 2013. None of the repeat samples showed the presence of total coliform bacteria.
19 Due to the above-mentioned total coliform positive samples, the Water Company failed the
20 total coliform MCL for the month of July 2013. None of the positive samples showed the
21 presence of fecal coliform or *E. coli* bacteria. All distribution water samples for coliform
22 bacteria collected during July 2013 are summarized in Attachment A.

23
24 The cause of the contamination is unknown since no specific source of contamination has
25 been identified. The Water Company does not provide for continuous disinfection of the
26 distribution system. Triggered source monitoring was conducted from the only active well,
27 and analytical results were negative for both total coliform and *E. coli* bacteria.

1
2 The above violation is classified as a non-continuing violation.
3

4 **ASSOCIATED VIOLATIONS**

5 Additionally, the Water Company has failed to comply with the following Section 64424 of
6 Title 22, CCR:
7

8 Sections 64424(a)(1) and 64424(b) specifies that a repeat sample set shall consist of at least
9 three samples for each total coliform-positive sample as follows: one from the routine
10 sample site at which the positive occurred, another from within five service connections
11 upstream of the original site and a third from within five service connections downstream
12 from the original sample site unless there is no upstream and/or downstream service
13 connections. Although the Water Company did take repeat samples from sites upstream
14 and downstream of the routine positives, they failed to take a repeat sample from one of the
15 three routine sample sites at which the positives occurred.
16

17 The above violations are classified as non-continuing violations.
18

19 **NOTIFICATION REQUIREMENTS**

20 Section 64426.1(c) requires a public water system to notify the Department and the
21 consumers of the water system, when a violation of the total coliform MCL occurs.
22 Notification to the Department shall be by the end of the business day on which the
23 violation has been determined. If the Department is closed, notification shall be within 24
24 hours of the determination. The Department was notified on July 5, 2013, in accordance
25 with the above-referenced section.
26
27

1 A Tier 2 Public Notice for violations of paragraphs 64426.1(b)(2) shall be given pursuant to
2 Section 64463.4 [lists method, time-frame and delivery] and 64465 [content & format].
3 The Tier 2 Public Notice shall include the mandatory health effects language from
4 Appendix 64465-A for a total coliform MCL failure.

5
6 The Water Company shall either mail or conduct direct delivery of the public notice to all
7 customers served within the general service area. Section 116450(g) requires that upon
8 receipt of notification from a public water system, schools must notify school employees,
9 students, and parents (if the students are minors), residential rental property owners or
10 managers (including nursing homes and care facilities) must notify their tenants and
11 business property owners, managers or operators must notify employees of businesses
12 located on the property. These secondary notification requirements are included in the
13 public notice (Attachment B). The Department hereby waives public notification by
14 newspaper, posting or delivery to community organizations.

15
16 Proof of notification is required. The Water Company shall complete Attachment C and
17 return it to the Department by **August 30, 2013**.

18
19 **DIRECTIVES**

20 The Water Company is hereby directed to take the following actions:

- 21
22 1. By **August 16, 2013**, provide public notification of the total coliform Maximum
23 Contaminant Level failure by direct delivery by hand or mail to each consumer.

24
25 By **August 30, 2013** the Water Company shall provide proof of hand or mail
26 delivery of the total coliform MCL violation notification to each consumer using
27 Attachment C, to:

1 Tricia A. Wathen, Senior Sanitary Engineer
2 Department of Public Health
3 Drinking Water Field Operations Branch
4 265 W. Bullard Avenue, Suite 101
5 Fresno, CA 93704

- 6 2. The Water Company shall collect repeat samples as required by Section 64424 and
7 as discussed in this Citation whenever a routine sample is positive for total coliform
8 bacteria.
- 9
- 10 3. The Water Company shall collect five (5) routine samples for total coliform analysis
11 during the month of August 2013.
- 12
- 13 4. By August 30, 2013, the Water Company shall complete and submit the enclosed
14 "Positive Total Coliform Investigation" form to the Department that describes the
15 incident and all corrective actions taken, and the results of the investigation. The
16 appropriate investigation report is provided as Attachment D.
- 17
- 18 5. By September 30, 2013, an injection port for emergency continuous chlorination
19 equipment shall be installed on the discharge of the well. The installation shall be
20 conducted by a person qualified and experienced with chlorination equipment. The
21 Water Company currently contracts with Seaco Technologies. If emergency
22 chlorination was required, Seaco should use the injection port as a connection for a
23 chemical metering pump. An Emergency Chlorination Plan (ECP) needs to be
24 submitted to the Department with photo documentation showing that the necessary
25 injection port is available at the well site. ECP requirements are outlined in
26 Appendix E. Any chemical that is added to the drinking water is required to be
27 NSF/ANSI Standard 60 approved.

CIVIL PENALTIES

Sections 116650(d) and 116650(e) of the CHSC allow for the assessment of a civil penalty for failure to comply with requirements of the California Safe Drinking Water Act. Failure to comply with any provision of this Citation may result in the Department imposing an administrative penalty of not less than \$100 (one hundred dollars) per day as of the date of violation of any provision of this Citation.

July 16, 2013
Date

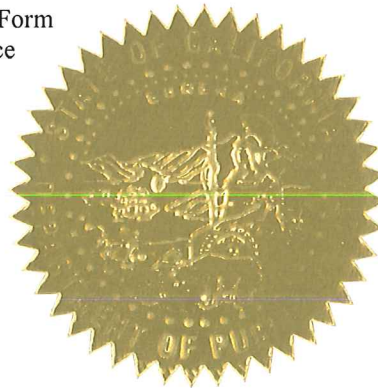
Tricia A. Wathen
Tricia A. Wathen, P.E.
Senior Sanitary Engineer, Visalia District
DRINKING WATER FIELD OPERATIONS BRANCH

TW/SF

Attachments:

Attachment A:	Summary of Bacteriological Samples collected in July 2013.
Attachment B:	Public Notice
Attachment C:	Proof of Notification Form
Attachment D:	Positive Total Coliform Investigation Form
Attachment E:	Emergency Chlorination Plan Guidance

03-12-13C-013



Bacteriological Distribution Monitoring Report

1502622 Gosford Road WC

Distribution System Freq: 1/M

Sample Date	Location	T Coli	E Coli	F Coli	HPC	Type	CI2	CI2 Avg	Viol. Type	GWR Satisfied?	Comments
7/2/2013	14106 Garrin Rd.	P	A			Routine			MCL	Yes	Cit 03-12-13C-013 issue TC+ occurred consecutiv in Dist. Repeats were to taken up and downstrea the 3 TC+
7/2/2013	7931 Garrin Rd.	P	A			Routine				Yes	
7/2/2013	7801 Garrin Rd.	A	A			Routine					
7/2/2013	7732 Garrin Rd.	P	A			Routine				Yes	
7/2/2013	13958 Gosford Rd.	A	A			Routine					
7/8/2013	13958 Gosford. (Horse)	A	A			Repeat					
7/8/2013	13958 Gosford (Wash Station)	A	A			Repeat					
7/8/2013	14106 Garin Rd.	A	A			Repeat			MR5		7931 Garrin was not resampled following 7/2
7/8/2013	7732 Garrin Rd.	A	A			Repeat					

Violation Key

MCL	Exceeds the maximum contaminant level	MR5	Incorrect number of repeat samples as follow-up to a positive sample
MR1	No monthly sample for the report month	MR6	No source sample
MR2	No quarterly sample for the report month	MR7	No summary report submitted
MR3	Incorrect number of routine samples for the report month	MR8	Other comments and/or info
MR4	Did not collect 5 routine samples for previous month's positive sample	MR9	CI2 not reported

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Este informe contiene información muy importante sobre su agua potable.

Tradúzcalo o hable con alguien que lo entienda bien.

Gosford Road Water Company Has Levels of Coliform Bacteria Above the Drinking Water Standard

Our water system recently failed a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what you should do, what happened and what we did to correct this situation.

We routinely monitor for drinking water contaminants. We took nine (9) samples to test for the presence of coliform bacteria in **July, 2013**. Three (3) of these samples showed the presence of total coliform bacteria. The standard is that no more than 1 sample per month may show the presence of coliform bacteria.

What should I do?

- **You do not need to boil your water or take other corrective actions.**
- This is not an emergency. If it had been, you would have been notified immediately. Total coliform bacteria are generally not harmful themselves. *Coliforms are bacteria which are naturally present in the environment and are used as an indicator that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.*
- Usually, coliforms are a sign that there could be a problem with the treatment or distribution system (pipes). Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of greater concern, such as fecal coliform or *E. coli*, are present. **We did not find any of these bacteria in our subsequent testing.**
- People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. General guidelines on ways to lessen the risk of infection by microbes are available from EPA's Safe Drinking Water Hotline at 1(800) 426-4791.
- If you have other health issues concerning the consumption of this water, you may wish to consult your doctor.

What happened? What is being done?

[Describe corrective action.] _____ We anticipate resolving the problem within _____ [estimated time frame].

For more information, please contact _____ [insert name of contact] at _____ [insert phone number] or at the following mailing address: _____ [insert business/mailling address].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this public notice in a public place or distributing copies by hand or mail.

Secondary Notification Requirements

Upon receipt of notification from a person operating a public water system, the following notification must be given within 10 days [Health and Safety Code Section 116450(g)]:

- **SCHOOLS:** Must notify school employees, students, and parents (if the students are minors).
- **RESIDENTIAL RENTAL PROPERTY OWNERS OR MANAGERS** (including nursing homes and care facilities): Must notify tenants.
- **BUSINESS PROPERTY OWNERS, MANAGERS, OR OPERATORS:** Must notify employees of businesses located on the property.

This notice is being sent to you by Gosford Road Water Company.

Date distributed: _____

PROOF OF NOTIFICATION
(Return with copy of the Notice)

As required by Section 116450 of the California Health and Safety Code, I notified all users of water supplied by the **Gosford Road Water Company** of the failure to meet the **total coliform bacteria MCL** for the month of **July 2013** as directed by the Department. At least one primary distribution method is required: mail, hand-delivery or newspaper publication. A second method is also required in order to reach persons not likely to be reached by a mailing, direct delivery or newspaper publication (renters, nursing home patients, prison inmates, etc.):

Notification was made on _____.
(date)

To summarize report delivery used and good-faith efforts used, please check all items below that apply and fill-in where appropriate:

- ☐ The notice was distributed by mail delivery to each customer served by the water system.
- ☐ The notice was distributed by direct delivery to each customer served by the water system. Specify direct delivery method(s) used: _____
- ☐ Publication of the notice in a local newspaper or newsletter of general circulation (attach a copy of the published notice, including name of newspaper and date published).
- ☐ Posted the notice at the following conspicuous locations served by the water system (if needed, please attach a list of locations). _____
- ☐ Posted the notice on the Internet at www. _____
- ☐ Other method used to notify customers. _____

DISCLOSURE: Be advised that Section 116725 and 116730 of the California Health and Safety Code state that any person who knowingly makes any false statement on any report or document submitted for the purpose of compliance with the attached order may be liable for a civil penalty not to exceed five thousand dollars (\$5,000) for separate violation for each day that violation continues. In addition, the violators may be prosecuted in criminal court and upon conviction, be punished by a fine of not more than \$25,000 for each day of violation, or be imprisoned in the county jail not to exceed one year, or by both the fine and imprisonment.

Certified by Name and Title: _____

Date: _____ Signature: _____

Due to the Dept. of Health Services within 10 days of notification to the public
Total Coliform MCL Failure

POSITIVE TOTAL COLIFORM INVESTIGATION

Simple Well with Pressure Tank Systems

This form is intended to assist public water systems in completing the investigation required by the California Department of Public Health (Section 64426(b) of Title 22, California Code of Regulations) and may be modified to take into account conditions unique to the system.

ADMINISTRATIVE INFORMATION

PWS Name:		PWS ID NUMBER:	
		Address	Telephone #
Name			
Operator in Responsible Charge (ORC)			
Person that collected TC samples if different than ORC			
Owner			
Certified Laboratory for Microbiological Analyses			
Date Investigation Completed:			
Month(s) of Total Coliform MCL Failure:			

INVESTIGATION DETAILS

SOURCE	WELL (name)	WELL (name)	WELL (name)	WELL (name)	COMMENTS
1. Inspect each well head for physical defects and report					
a. Is raw water sample tap upstream from point of disinfection?					
b. Is wellhead vent pipe screened?					
c. Is wellhead seal watertight?					
d. Is well head located in pit or is any piping from the wellhead submerged?					
e. Does the ground surface slope towards well head?					
f. Is there evidence of standing water near the wellhead?					
g. Is there a check valve on the well discharge line? Is the check valve seating properly?					
h. Are there any connections to the raw water piping that could be cross connections? (describe all connections in comments)					
i. Is the wellhead secured to prevent unauthorized access?					
j. To what treatment plant (name) does this well pump?					
k. How often do you take a raw water total coliform (TC) test?					
l. Provide the date and result of the last TC test at this location					

POSITIVE TOTAL COLIFORM INVESTIGATION

Page 2 of 3

DISTRIBUTION SYSTEM	SYSTEM RESPONSES
1. What is the minimum pressure you are maintaining in the distribution system?	
2. Did pressure in the distribution system drop to less than 5 psi prior to experiencing the TCR positive finding.	
3. Has the distribution system been worked on within the last week? (service taps, hydrant flushing, main breaks, main extensions, etc.) If yes, provide details.	
4. Are there any signs of excavations near your distribution system not under the direct control of your maintenance staff?	
5. Did you inspect your distribution system to check for mainline leaks? Do you or did you have a mainline leak?	
6. If there was a mainline leak, when was it repaired?	
7. On what date was the distribution system last flushed?	
8. Is there a written flushing procedure you can provide for our review?	
9. Do you have an active cross connection control program?	
10. What is name and phone number of your Cross-Connection Control Program Coordinator?	
11. Is the review and testing of backflow prevention devices current?	
12. On what date was the last physical survey of the system done to identify cross-connections?	

SAMPLE SITE EVALUATION (Complete for all TC+ or EC+ findings)	Routine Site TC+ or EC+	Upstream Site	Downstream Site	Sample 4 (specify)
1. What is the height of the sample tap above grade? (inches)				
2. Is the sample tap located in an exterior location or is it protected by an enclosure ?				
3. Is the sample tap threaded, have a swing arm (kitchen sink) or aerator (sinks)?				
4. Is the sample tap in good condition, free of leaks around the stem or packing?				
5. Can the sample tap be adjusted to the point where a good laminar flow can be achieved without excessive splash?				
6. Is the sample tap and area around the sample tap clean and dry (free of animal droppings, other contaminants or spray irrigation systems)				
7. Is the area around the sample tap free of excessive vegetation or other impediments to sample collection				
8. Describe how the tap was treated in preparation for sample collection (ran water, swabbed with disinfectant, flamed, etc.)				
9. Is this sample tap designated on the sampling plan submitted with this information request?				
10. What were the weather conditions at the time of the positive sample (rainy, windy, sunny)				

POSITIVE TOTAL COLIFORM INVESTIGATION

Page 3 of 3

GENERAL OPERATIONS:	Response
1. Where there any power outages that affected water system facilities during the 30 days prior to the TC+ or EC + findings?	
2. Where there any main breaks, water outages, or low pressure reported in the service area where TC+ or EC+ samples were located.	
3. Does the system have backup power or elevated storage?	
4. During or soon after bacteriological quality problems, did you receive any complaints of any customers' illness suspected of being waterborne? How many?	
5. What were the symptoms of illness if you received complaints about customers being sick?	

ADDITIONAL INFORMATION TO BE SUBMITTED WITH RESPONSES TO THE ABOVE QUESTIONS

1. **Sketch** of System showing all sources, treatment locations, storage tanks, microbiological sampling sites and general layout of the distribution system including the location of all hazardous connections such as the wastewater treatment facility.
2. A set of photographs of the well, pressure tanks, and storage tanks in the system may be submitted if they would show that the contamination is directly related and changes have been made since the last inspection by our Department
3. Name, certification level and certificate number of the Operator in Responsible Charge.
4. Copy of the last cross connection survey performed that identifies the location of all unprotected cross connections.

SUMMARY: BASED ON THE RESULTS OF YOUR INVESTIGATION AND ANY OTHER INFORMATION AT YOUR DISPOSAL, WHAT DO YOU BELIEVE TO BE THE CAUSE OF THE POSITIVE TOTAL COLIFORM SAMPLES FROM YOUR PUBLIC WATER SYSTEM?

CERTIFICATION: I CERTIFY THAT THE INFORMATION SUBMITTED IN RESPONSE TO THE QUESTIONS ABOVE IS ACCURATE TO THE BEST OF MY PROFESSIONAL KNOWLEDGE

NAME: _____ TITLE: _____ DATE: _____



State of California—Health and Human Services Agency
California Department of Public Health

Attachment E



EDMUND G. BROWN JR.
Governor

California Department of Public Health
Visalia District

EMERGENCY DISINFECTION PLAN REQUIREMENTS

An emergency disinfection plan, designed to outline procedures in the event of bacteriological contamination, shall be developed and a copy submitted to the California Department of Public Health (CDPH) Visalia District office. The plan shall outline specific response procedures for disinfection of wells, pressure tanks, storage tanks and installation of emergency chlorination equipment. Guidance on the operation of the emergency disinfection equipment, to be included in the Emergency Disinfection Plan, are included in the attached document (Emergency Disinfection Plan Guidance).

The plan shall state that the necessary equipment is on-site or readily available and the means by which to connect and activate it have been provided. Those items needed to accommodate emergency chlorination equipment include:

- An all weather, 110 volt electrical receptacle, energized by the well pump operation.
- A three-quarter (3/4) inch threaded tap on the piping downstream of the well check valves for use as a chlorine injection point.
- A sample tap (non-threaded) at least three to six feet downstream of the chlorine injection point.

The plan should further state that qualified personnel (specify who) are under contract to carry out the plan and install, adjust and operate the equipment as necessary. The plan should also include the treatment or distribution operator certification grade and emergency telephone numbers of water system staff and certified operator(s).

Attachment: Emergency Disinfection Plan Guidance

Emergency Disinfection Plan Guidance for Public Water Systems

The purpose of this Emergency Disinfection Plan (EDP) is to assist utilities implementing emergency chlorination. The guidance provided below is designed to facilitate the installation of emergency chlorination equipment and to assist in the setting of chemical dosage in order to maintain acceptable free chlorine residual needed to insure public health protection immediately after a disaster. Items which should be obtained prior to the onset of a disaster include the following equipment:

1. Emergency chlorination units.
2. Chlorine residual test kits (preferably DPD)
3. Granular Calcium Hypochlorite, 65% available chlorine, (liquid sodium hypochlorite has a relatively short shelf life so it is advisable that it not be purchased in advance). Chemicals used for emergency chlorination must be approved under ANSI/NSF¹ Standard 60 (direct additives).

Installation Procedures

A utility should not wait until an emergency has occurred before it attempts to install its emergency chlorination equipment. It is advisable that all field maintenance staff be familiar with the installation procedures in order to quickly install the emergency chlorination equipment. The remainder of this plan addresses the use of hypochlorinators in the event of an emergency. For those utilities which use gas chlorination units, they should already be familiar with their operation if they are using this type of equipment.

The chlorination equipment purchased by the utility must be adequately sized for the proposed installation. The feed capacity of the hypochlorinator should allow the utility to do at a minimum of 5 parts per million free chlorine residual. After the emergency chlorination units have been physically connected to the wells and/or other sources in question, refer to the attached table or use the following procedures to calculate the appropriate settings. If you are unable to perform these calculations, contact a staff of the Drinking Water Program immediately.

The attached tables may be used to mix a solution of a known strength. Decide on a solution strength that you wish to use and find the amount of chlorine needed for a 100 gallon barrel from Table 1.

Table 2 can be used to determine the volume of solution to be added for different flow rates for each mg/L of chlorine dosage. It should be recognized that large capacity wells will need stronger solution strengths or the feed barrel will need to be filled too frequently. The volumes in table 2 are in gallons per day (gpd). If the feed pump capacity is given in gallons per hour, then the volume from Table 2 must be divided by 24 to give a gph value.

To determine the appropriate pump setting, the value from Table 2 must be divided by the feed pump capacity.

Example:

Feed Pump Capacity = 10 gph; Q = 1500 gpm; 7% solution; 5 mg/L dosage

From table 2 → Chlorine Volume = 30.9 gpd for each mg/L.

For 5 mg/L → $5 \times (30.9) = 154.5$ gpd

Since feed pump has a maximum capacity of 10 gph, the appropriate length of stroke setting is:

$$\frac{154.5 / 24}{10 \text{ gph}} = 0.64$$

Outlined below are the equations to use if the Tables are not used:

1. A solution barrel of a known volume must be obtained. The barrel should be filled with a known volume of water. To this volume, a known weight of chemical should be added. The solution strength must be determined using the equation given below:

$$\% \text{ solution} = \frac{\text{Weight of chemical added to solution barrel (lbs)}}{\text{Weight of water in solution barrel (lbs)}} \times 100$$

(1 gallon of water weighs 8.34 lbs)

A 6% solution can be obtained by adding one half pound of chemical per gallon of water using a 100 gallon barrel. (see below):

$$50 / (100 \times 8.34 \text{ lb/gal of water}) \times 100 = 5.99 \text{ or } 6\%$$



used to get percentage

To calculate the pounds per hour of chemical that must be added to obtain a know chlorine concentration, the following equation must be used:

Equation #1:

$$\text{lbs per hour of chemical} = 8.34 \times \text{desired dosage in ppm} \times \text{flow rate in gpm} \times 60 \text{ min}/1,000,000$$

Assuming the desired dosage is 5 ppm that gives the following equation:

Equation #2: lbs per hour of chemical = 2.5×10^{-3} x flow rate in gpm

Next you must determine the required gallons per hour of chemical to be added. This must be obtained using the following equation:

Equation #3:

gallons per hour of chemical = lbs per hour / 8.34 / solution strength / 100 (from above)

Once this value has been obtained, then the next step is to review the maximum feed rate in gallons per day of the chemical feed pump. This is generally printed in a label attached to the pump and it may specify the discharge pressure this maximum rate applies to. Most chemical feed pumps have either a length of stroke setting or two settings for frequency of stroke and length of stroke. To determine what settings should be used, a review of the instrumentation on the pump must be conducted.

If two control settings are provided, then set the frequency control at 100% and provide adjustment only to the length of stroke adjustment. The equation to be used to determine at what setting the length of stroke should be, is given below:

Percent length of stroke = gallons per hour (obtained above) x 24 x 100 / the pump capacity in gpd

This numerical setting should be used when adjusting the pump. If both pump settings are to be changed from 100%, then the percent stroke equation is as follows:

Percent length of stroke = gallons per hour x 24 x 100 / stroke frequency / pump capacity in gpd

A check on the actual dosage can be performed by using the total gallons of solution pumped within a known operating period. That information can be used as follows:

Actual Dosage = $\frac{\text{gallons of solution} \times \text{solution strength}}{\text{gallons of water treated in MG}}$

An easier way to use hypochlorination equipment is to have calibration or volumetric feed cylinders installed on the intake line to the pump. If these cylinders are available, then a known volume of solution can be pumped and the time it takes to pump that volume is used to determine gallons per hour at a known discharge pressure. The actual percent solution must still be known to conduct the other calculations.

Once a utility has implemented emergency chlorination of their system, it is important to conduct follow up distribution chlorine residual monitoring to determine the effectiveness of the chlorination process. In the event of an emergency, hypochlorination equipment should be used to dose the system at 2 ppm of free chlorine residual. Chlorine residual monitoring within the distribution system should take place to verify that an adequate residual is being obtained

at all locations within the distribution system. Any areas which have suppressed chlorine residuals should receive further investigation to determine whether or not there are other problems associated with the reduced residuals.

Flushing should be provided if possible, to draw the chlorinated water into the distribution system as soon as possible.

In addition to the chlorine residual monitoring, bacteriological sampling of the distribution system in all areas should be conducted. Chlorine residual monitoring in addition to bacteriological sampling should be used to further define areas of distribution system that need additional investigation. Chlorination of the system should continue until it has been verified that no structural problems exist within the distribution system and all bacteriological monitoring shows that there is no presence of pathogenic organisms.

TABLE 1

AMOUNT OF CHLORINE PER 100 GALLON BARREL *

	Solution Strength	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
Type of Chlorine												
5% Sodium Hypochlorite**		60 gal	80 gal	100 gal								
12.5% Sodium Hypochlorite**		24 gal	32 gal	40 gal	48 gal	56 gal	64 gal	72 gal	80 gal	88 gal	96 gal	
65% Calcium Hypochlorite***		38 lbs	51 lbs	64 lbs	77 lbs	90 lbs	103 lbs	116 lbs	128 lbs	141 lbs	167 lbs	

* Add the quantity indicated to the 100 gallon barrel and then fill the remaining volume with water.

** The sodium hypochlorite must be ANSI/NSF¹ certified for potable drinking water and approved as direct additive (ANSI/NSF Standard 60).
1: American National Standard Institute (ANSI) or National Sanitation Foundation (NSF)

*** HTH, tablets or granular chlorine

Example: For 10% solution using 12.5% sodium hypochlorite, use 80 gallons of sodium hypochlorite and add 20 gallons of water.

Example: For 10% solution using 65% available Calcium Hypochlorite (CaHOCl), use 128 lbs of granular chlorine and add water to fill barrel and mix.

TABLE 2

CHLORINE VOLUME REQUIRED GALLONS PER DAY (GPD) PER MG/L OR PPM OF DESIRED CHLORINE DOSAGE*

Flow Rate	Solution Strength	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
50 gpm		2.4	1.8	1.4	1.2	1.03	0.9	0.8	0.7	0.7	0.6	0.6
75 gpm		3.6	2.7	2.0	1.8	1.5	1.4	1.2	1.0	1.0	0.9	0.8
100 gpm		4.8	3.6	2.9	2.4	2.0	1.8	1.6	1.4	1.3	1.2	1.1
300 gpm		14.4	10.8	8.6	7.2	6.2	5.4	4.8	4.3	3.9	3.6	3.3
500 gpm		24.0	18.0	14.4	12.0	10.3	9.0	8.0	7.2	6.6	6.0	5.5
800 gpm		38.4	28.8	23.0	19.2	16.5	14.4	12.8	11.5	10.5	9.6	8.9
1000 gpm		48.0	36.0	28.0	24.0	20.6	18.0	16.0	14.4	13.1	12.0	11.1
1500 gpm		72.0	54.0	21.5	36.0	30.9	27.0	24.0	21.6	19.6	18.0	16.6
2000 gpm		96.0	72.0	57.6	48.0	41.1	36.0	32.0	28.8	26.2	24.0	22.2

* Values in the Table are the flow rates in gallons of solution per day that be added for each mg/L of desired dosage.

Example: Well Discharge = 1,000 gpm
 Solution Strength = 5%
 Desired Dosage = 5 mg/L or 5 ppm

From Table 2, Need to add 28.8 gpd per mg/L (or ppm)
 Therefore, 5 mg/L x 28.8 gpd/(mg/L) = 144 gpd.